

Sub  
B7

associated with the breaking-out tool is a support means (20, 20a, 20b, 20n) which is movable in the direction of movement of the breaking-out tool and which is rigidly connected in positively locking relationship to the breaking-out surface or female die in the edge region of the opening and which projects into the opening with a support or contact surface (24, 25, 34) which can be inclined with respect to said connection pairing and which in the rest position engages in substantially parallel relationship under the waste portion or broken-out piece disposed in the sheet of material and which is adapted to be variable in its position upon the movement of the waste portion by the breaking-out tool and in particular is adapted to be transferred into an angle of inclination relative to the sheet of material in the downward movement of the waste portion, wherein the connection pairing for the support means comprises at least one undercut receiving groove (28, 31) on the one hand and a portion (27, 29) which can be fitted therinto and which extends in the breaking-out direction (x) on the other hand, characterized in that the cross-sections of the receiving groove (28, 31) and the portion forming a coupling rib or bar (27, 29) are of a dovetail-shaped configuration, wherein the support means (20, 20a, 20b, 20n) is in longitudinal section an angle portion with at least one coupling rib (27) which is formed out of one of its limbs (22) for a receiving groove (28) of the female die (14) or with a vertical groove (31) formed in a limb (22) for a coupling rib

Sub B1  
(29) of the female die on the one hand and with another flexible limb (24, 34) forming the support surface (25) on the other hand.

40. Apparatus for removing broken-out pieces, in particular waste portions (12), from a sheet of material (10) which contains blanks or the like flat portions and which rests on a female die (14, 14<sub>a</sub>) or the like breaking-out surface in such a way that the broken-out portion extends over an opening (16, 16<sub>a</sub>) in the breaking-out surface and is urged away through the opening under the pressure of at least one breaking-out tool (40, 41), wherein associated with the breaking-out tool is a support means (20<sub>a</sub>, 62) which is movable in the direction of movement of the breaking-out tool and which is rigidly connected in positively locking relationship to the breaking-out surface or female die in the edge region of the opening and which projects into the opening with a support or contact surface (24, 25, 34) which can be inclined with respect to said connection pairing and which in the rest position engages in substantially parallel relationship under the waste portion or broken-out piece disposed in the sheet of material and which is adapted to be variable in its position upon the movement of the waste portion by the breaking-out tool and in particular is adapted to be transferred into an angle of inclination relative to the sheet of material in the downward movement of the waste portion, wherein the connection pairing is adapted to be brought together in the breaking-out direction (x), characterized in that the connection pairing comprises at least

one receiving groove (28<sub>a</sub>, 28<sub>b</sub>) in the female die (14) at the edge of the opening (16) thereof on the one hand and a portion (80, 92, 97), which can be fitted thereinto, of a vertical limb (22) of the support tool (20<sub>e</sub>, 20<sub>f</sub>, 21) on the other hand, or that the connection pairing comprises a plug-in profile portion (65) of the female die and an associated hollow profile portion (63) which is formed by a limb of an angle portion as a shaped support portion (62) whose other limb is a support lip (64), wherein the shape of the hollow profile portion corresponds to that of a cylindrical cup.

41. Apparatus as set forth in claim 40, characterized in that formed on the vertical limb (22) is at least one pin-like plug-in element (80, 92) which extends or extend at a spacing (y) relative to the vertical limb and which is respectively adapted to be inserted into an opening (84, 94) provided in the female die (14) at a spacing (y) relative to the receiving groove (28<sub>a</sub>) and is removable in the breaking-out direction (x).

42. Apparatus as set forth in claim 41, characterized in that the plug-in element (80, 92) and the opening (84) are of rectangular cross-section and/or that the plug-in element (80) projects from a transverse web portion (82) at a spacing (y) relative to the rear surface of the vertical limb (22).

43. Apparatus as set forth in claim 41, characterized in that the plug-in element (80, 92) projects up from a transverse web portion (82) at a spacing (y) relative to the flank surface of the vertical limb (22).

44. Apparatus as set forth in claim 40, characterized in that the flank surfaces (88) of the vertical groove (28<sub>a</sub>, 28<sub>b</sub>) are stepped and the vertical limb (22) is supported in the rear region (90) of the vertical groove, which rear region is of narrower cross-section.

45. Apparatus as set forth in claim 40, characterized in that the vertical limb (97) is fitted with a plug-in slot (98) on to a limb (100) of an angle bracket (102), which extends in the vertical groove (28<sub>b</sub>), while the other limb (101) of the angle bracket is connected to the female die (14).

46. Apparatus as set forth in claim 40, characterized in that shaped support portions (62) which are arranged in the opening (16<sub>a</sub>) at the edge thereof and which are fitted on to plug-in profile members (65) are disposed in mutually opposite relationship, the support portions (62) being provided with radial support lips (64) of elastic material which are directed towards each other.

Sub  
BP

47. Apparatus as set forth in claim 39, characterized in that the flexible limb (24) forming the support surface (25) has an edge opening (32) which is delimited on both sides by cantilever portions (34), and at least one inner opening (30) at a spacing in relation to the edge opening (32).

48. Apparatus as set forth in claim 39, characterized in that arranged downstream, in the breaking-out direction (x), of the limb (24) forming the support surface (25) is at least one catch finger (38), in particular a pair of catch fingers.

A1

49. Apparatus as set forth in claim 39, characterized in that the limb (24) forming the support surface (25) is flanked by side portions which are formed on the other limb (22) and form the catch fingers (38).

50. Apparatus as set forth in claim 48, characterized in that the catch finger (38) is enlarged in longitudinal section from its free end (36) towards the limb (22) formed thereon.

51. Apparatus as set forth in claim 39, characterized in that the support tool (20<sub>a</sub>) has a partial frame which is substantially U-shaped in cross-section and which comprises a back portion including the coupling rib or ribs (27), with two parallel side walls (23), wherein a support plate (46, 46<sub>a</sub>) is arranged pivotably about an axis (A) between the side walls.

Sub  
B11

52. Apparatus as set forth in claim 39, characterized in that the breaking-out tool or tools (40; 41, 42) extends or extend between surfaces (34, 34<sub>a</sub>) of the support means (20, 20<sub>a</sub>, 20<sub>b</sub>, 20<sub>n</sub>), said surfaces being movable in the breaking-out direction (x).

A

53. Apparatus as set forth in claim 39, characterized in that the portion (24; 46, 46<sub>a</sub>; 64) including the support surface (25) is provided at its free edge (35) with at least one edge opening (32), wherein possibly the edge opening or openings is or are disposed in opposite relationship to the free end or ends of the breaking-out tool (40, 41).

54. Apparatus as set forth in claim 39, characterized in that disposed opposite the support surface (25) as a breaking-out tool is a pressure pin (40) with a rounded free end which is in the form of a rough surface.

55. Apparatus as set forth in claim 39, characterized in that associated with the support surface (25) as a breaking-out tool is a fork member (41, 41<sub>a</sub>, 41<sub>b</sub>) with one or more finger-like fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>) of preferably flat cross-section, wherein preferably the free end of the pressure pin (40) or the fork prong (42, 42<sub>a</sub>, 42<sub>b</sub>) is in the form of a rough surface.

56. Apparatus as set forth in claim 55, characterized in that the free end of the fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>) is formed by a part-circular curve (43<sub>a</sub> in Figures 18, 23) formed therein or a tip (Figures 30, 31) formed out thereon.

57. Apparatus as set forth in claim 54, characterized in that the rough surface is formed by a coating (44), in particular a coating with oxides, carbides, corundum or the like.

58. Apparatus as set forth in claim 54, characterized in that the coating (44) is applied by means of thermal spraying.

59. Apparatus as set forth in claim 54, characterized in that the rough surface is formed by a coating of plastic material or rubber.

60. Apparatus as set forth in claim 54, characterized in that the rough surface is formed by irregularities provided in the surface of the pressure pin (40) or the fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>), wherein the surface of the pressure pin or the fork prongs (42) is roughened mechanically, chemically or electrically.

61. Apparatus as set forth in claim 55, characterized in that the axial height (h) of the rough surface (44) corresponds at most to the diameter (d) of the pressure pin (40) or the width of the fork prong (42).

62. Apparatus as set forth in claim 54, characterized in that projecting teeth (61, 61<sub>a</sub>), hooks (61<sub>b</sub>) or at least one shoulder (61<sub>c</sub>) in inclined relationship are formed out at the pressure pin (40) or fork prongs (42, 42<sub>a</sub>, 42<sub>b</sub>) near the end at a spacing in relation thereto.

Sub  
A1 612  
63. Apparatus as set forth in claim 55, characterized in that the fork member (41) projects from a plate-shaped male die (56), wherein possibly the portion of the fork member (41), which is connected to the male die (56), has clamping noses (60) and/or abutments (54).

64. Apparatus as set forth in claim 39, characterized by a clip-like tool (68 through 74) which is fixed to the opening (16, 16<sub>a</sub>) and which respectively includes a frame portion (76) from which resilient support tongues (34<sub>b</sub>) project inwardly or on which at least one inwardly disposed support plate (46<sub>b</sub>) is arranged movably about a pivot axis (A).

65. Apparatus as set forth in claim 64, characterized by a frame portion (76) which is at least partially curved in plan view or by a substantially rectangular frame portion (76).